

CHIMAEROID FISHES OF NEW CALEDONIA WITH DESCRIPTION OF A NEW SPECIES OF *HYDROLAGUS* (CHONDRICHTHYES, HOLOCEPHALI)

by

Dominique A. DIDIER (1) & Bernard SÉRET (2)

ABSTRACT. - Three species of chimaeroid fishes are reported from deep waters around New Caledonia: *Chimaera phantasma*, *Rhinochimaera pacifica* and *Hydrolagus trolli* n. sp., which is described from 23 specimens collected from New Caledonia and New Zealand at depths of 612 - 1707 m. The new species is distinguished from all other members of the genus by its blue-gray coloration, distinctly pointed snout, first dorsal fin concave along its posterior edge with a pale margin, preopercular and oral lateral-line canals usually sharing a common branch, males with a robust frontal tenaculum with the distal bulb upturned at its distal edge, denticles extending onto the dorsal surface and bifid pelvic claspers with the distal 1/3 divided and pale colored, fleshy distal lobes.

RÉSUMÉ. - Chimères de Nouvelle-Calédonie et description d'une nouvelle espèce du genre *Hydrolagus* (Chondrichthyes, Holocephali).

Trois espèces de chimères sont signalées dans les eaux profondes de Nouvelle-Calédonie: *Chimaera phantasma*, *Rhinochimaera pacifica* et *Hydrolagus trolli* sp. n., qui est décrite à partir de 23 spécimens collectés en Nouvelle-Calédonie et en Nouvelle-Zélande, entre 612 et 1707 m de profondeur. Cette nouvelle espèce se distingue de ses congénères par sa coloration gris-bleu, son museau nettement pointu, le bord postérieur de sa première nageoire dorsale concave et liseré de blanc, les canaux préoperculaires et oraux de la ligne latérale avec une branche commune, le tenaculum frontal des mâles robuste avec un bulbe distal retroussé et portant des denticules cutanés qui s'étendent sur sa face dorsale, les ptérygopodes bifides, leur tiers distal étant divisé en lobes charnus de couleur claire.

Key words. - Chondrichthyes - Holocephali - Chimaeroid - *Chimaera* - *Rhinochimaera* - *Hydrolagus* - PSW - New Caledonia - New species.

A large variety of chimaeroids are present in the southern Pacific Ocean. In particular, many new species have recently been discovered around New Zealand and Australia due to concentrated efforts in surveying these faunas (e.g., Paulin *et al.*, 1989; Last and Stevens, 1994).

In the same way, France has been carried out a series of deep sea exploratory cruises in the South-West Pacific (Richer de Forges, 1993; Séret, 1997; Séret *et al.*, 1997). These cruises revealed a high diversity of deep water fishes in the New Caledonian zone and also provided samples of a number of chondrichthyan fishes (Séret, 1994; Séret in Grandperrin *et al.*, 1997, 1999) including the chimaeroids herein described. The biogeographical significance of the New Caledonian chondrichthyan fauna in the tropical Australasian region has been pointed out by Last and Séret (1999).

At present there are at least 5 undescribed species of *Chimaera* and 5 new species of *Hydrolagus* known from southern Pacific Ocean. All of the recently discovered species of chimaeroids belong to the family Chimaeridae and

the two genera are distinguished by an anal fin anterior to the ventral caudal fin lobe (*Chimaera*) or absence of a separate anal fin (*Hydrolagus*). In addition to the discovery of new species, deep ocean trawling surveys are an important source for determining the geographic ranges of many species. *Chimaera phantasma* Jordan & Snyder, 1900 and *Rhinochimaera pacifica* (Misukuri, 1895) are newly reported from waters off New Caledonia. These records represent range extensions for both of these species.

MATERIAL AND METHODS

Specimens were collected by bottom trawl around New Caledonia during the HALIPRO 2 and HALICAL 1 cruises of 1995 and 1996. A total of 10 chimaeroid specimens were collected: 3 specimens of *Rhinochimaera pacifica*, 4 specimens of *Chimaera phantasma*, and 3 specimens of a previously undescribed species of *Hydrolagus*. This new species of *Hydrolagus* has also been collected from deep water fish-

(1) The Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103, USA. [dagit@acnatsci.org]

(2) Antenne IRD, laboratoire d'Ichtyologie générale et appliquée, Muséum national d'Histoire naturelle, 43 rue Cuvier, 75231 Paris Cedex 05, FRANCE. [seret@mnhn.fr]

ing grounds around New Zealand and additional specimens were borrowed from the National Museum of New Zealand Te Papa Tongarewa.

All specimens were measured point to point using a dial caliper and ruler or measuring tape. In some cases measurements were impossible to take due to distortion of the specimen and these are omitted from the tables. Definition of measurements and their acronyms, based on Compagno *et al.* (1990) and Didier and Stehmann (1996), follows Didier (1998) and Didier and Nakaya (1999). The following measurements were taken (Fig. 1): total length (TL); precaudal length (PCL) to origin of dorsal lobe of caudal fin; body length (BDL), dorsal edge of gill opening to origin of upper lobe of caudal fin; snout-vent length (SVL), distal tip of snout to cloacal opening; trunk length (TRL), ventral edge of gill opening to cloaca; pre-second dorsal length (PD2); pre-first dorsal length (PD1); pre-oral length (POR), snout tip to end of upper labial fold; pre-narial length (PRN), snout tip to anterior edge of nasal apertures; pre-orbital length (POB), snout tip to anterior edge of orbit; second

dorsal-fin base (D2B); maximum height of anterior 1/3 of the second dorsal fin (D2AH); maximum height of posterior 1/3 of the second dorsal fin (D2PH); first dorsal-fin base (D1B), from anterior edge of fin spine to insertion of first dorsal fin; (DSA), dorsal spine length along anterior margin; maximum height of first dorsal fin (D1H); dorsal caudal margin length (CDM); maximum height of dorsal lobe of caudal fin (CDH); ventral caudal margin (CVM) from origin to insertion of lower caudal fin; total caudal length (CTL), from origin of upper caudal fin to end of caudal filament; maximum height of ventral lobe of caudal fin (CVH); head length (HDL); pectoral-fin anterior margin (P1A); pelvic-fin anterior margin (P2A); interdorsal space (IDS); dorsal-caudal space (DCS); anterior edge of first dorsal-fin base to anterior edge of pectoral-fin base (D1P1); anterior edge of base of first dorsal-fin to anterior edge of pelvic-fin base (D1P2); anterior edge of second dorsal-fin base to anterior edge of pectoral-fin base (D2P1); anterior edge of second dorsal-fin base to anterior edge of pelvic-fin base (D2P2); posterior base of pectoral-fin to anterior base

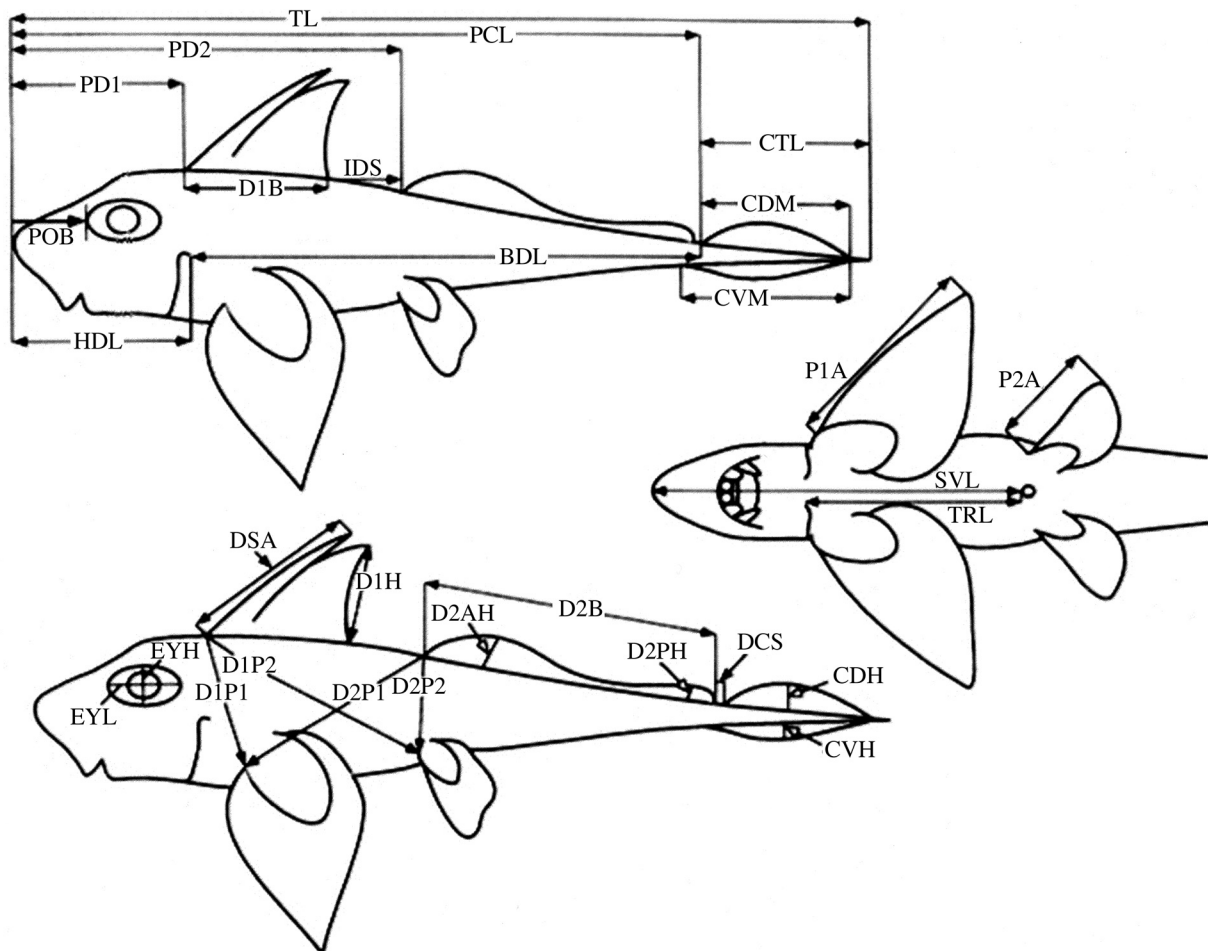


Figure 1. - Diagram of point-to-point body measurements. Some measurements are shown between parallels for ease of illustration. Measurement of the pelvic claspers is not shown.

of pelvic fin (P2P); eye length (EYL); eye height (EYH); total length of claspers from pelvic-fin base to tip (CLT); length of medial branch of clasper from fork to tip (CLM); length of lateral branch of clasper from fork to tip (CLL).

In addition to body measurements, the following 8 measurements from the lateral-line canals of the head were also taken (Fig. 2): distance from anterior oronasal fold to center of nasal canal (ONC); length of the rostral canal (LRC); length of the nasal canal measured as a straight line distance from right to left side (LNC); distance between infraorbital and angular canal measured as the straight line distance from junction of the oral and infraorbital canal to the junction of the oral and angular canal (IOA); distance between preopercular canal and main trunk canal measured from their junction with the infraorbital canal (OTM); distance between main trunk canal and supratemporal canal mea-

sured from their junctions with the infraorbital and postorbital canals, respectively (OCL); length of supratemporal canal measured across the head from its junctions with the postorbital canal (STL); distance from anterior base of spine to the center of the supratemporal canal (SPS). Measurements of the lateral line canals of the head were not obtained for all specimens because it was only recently discovered that these proportions might be useful for species identification (Didier and Nakaya, 1999) and these data may not be listed in all of the Tables.

Sexual maturity in males was determined by the emergence of the frontal tenaculum, hardened pelvic claspers, and denticles present on the pelvic claspers, frontal tenaculum, and prepelvic tenacula. Sexually mature females were identified by opened, and usually distended, oviductal openings. All other fish were classified as juveniles. Juveniles were further categorized as subadults - juveniles approaching sexual maturity based on body size and condition of secondary sexual features; juveniles - greater than 200 mm TL yet not exhibiting signs of approaching sexual maturity; and hatchlings - post-hatching juveniles assumed to be yearling fish reaching total lengths up to 200 mm.

Institutional abbreviations follow Leviton *et al.* (1985).

HYDROLAGUS TROLLI SP. NOV.

(Figs 3-4)

Pointy-nosed blue chimaera (Chimère bleue à museau pointu).

Hydrolagus sp. C: Paulin *et al.*, 1989; *Hydrolagus* sp. cf. *lemures*: Séret in Grandperrin *et al.*, 1997; *Hydrolagus* sp.: Séret in Grandperrin *et al.*, 1999.

Material examined

Holotype. - MNHN 1998-679, adult male, 1030 mm TL, 650 mm BDL, South Pacific, New Caledonia (24°44.90'S - 167°43.10'E), 1246-1213 m, R/V "Tangaroa", HALIPRO 2, sta. BT74, 26 Nov. 1996, bottom trawl (Fig. 3).

Paratypes. - 22 specimens. NMNZ P20350, male, 1026 mm TL, 680 mm BDL, off Urry Bank, Chatham Rise (45°09.3-07.5'S, 174°27.9-27.8'E), 1092-1100 m, R/V "Arrow" A3/55/86, 8 Nov. 1986; NMNZ P20351, male, 1000 mm TL, 632 mm BDL, southeast of Vryan Bank, Chatham Rise (44°39.8-39.3'S, 176°41.0-43.7'E), 1153-1159 m, R/V "Arrow" A3/25/86, 4 Nov. 1986; NMNZ P24469, M, 1074 mm TL, 715 mm BDL, Pegasus Canyon (42°50.6'S, 174°14.6'E), 1146-1514 m, R/V "Willwatch" 015/89, 24 Sept. 1989; NMNZ P24470, male, 1045 mm TL, 664 mm BDL, Hikurangi Trough (40°07.2'S, 177°55.9'E), 1286-1502 m, R/V "Willwatch" 090/89; NMNZ P24471, male, 1067 mm TL, 870 mm BDL, Hikurangi Trough (39°51.9'S, 177°55.3'E), 1228-1276 m, R/V "Willwatch" 163/89; NMNZ P24478, male, 1075 mm TL, 673 mm BDL, Kahuter Ridge, Kowhai Seavalleys (42°33.2'S,

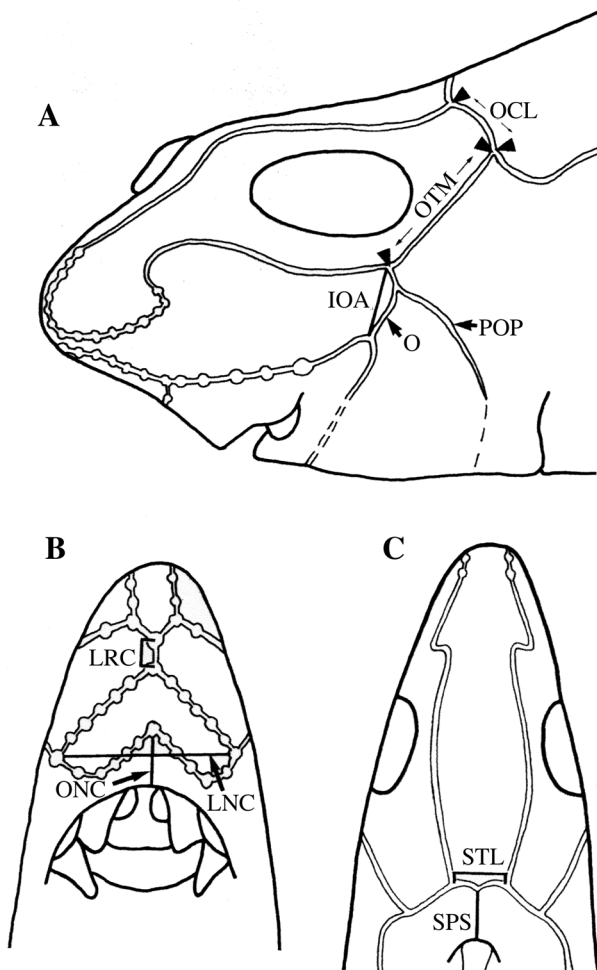


Figure 2. - Diagram of point-to-point measurements between lateral-line canal junctions (modified from Didier, 1995). A: Lateral view showing common canal trunk shared by the preopercular (POP) and oral (O) canals. Measurements of infraorbital canal (OTM) and postorbital canal (OCL) taken between points indicated at arrowheads. B: Ventral view of snout. C: Dorsal view of head.

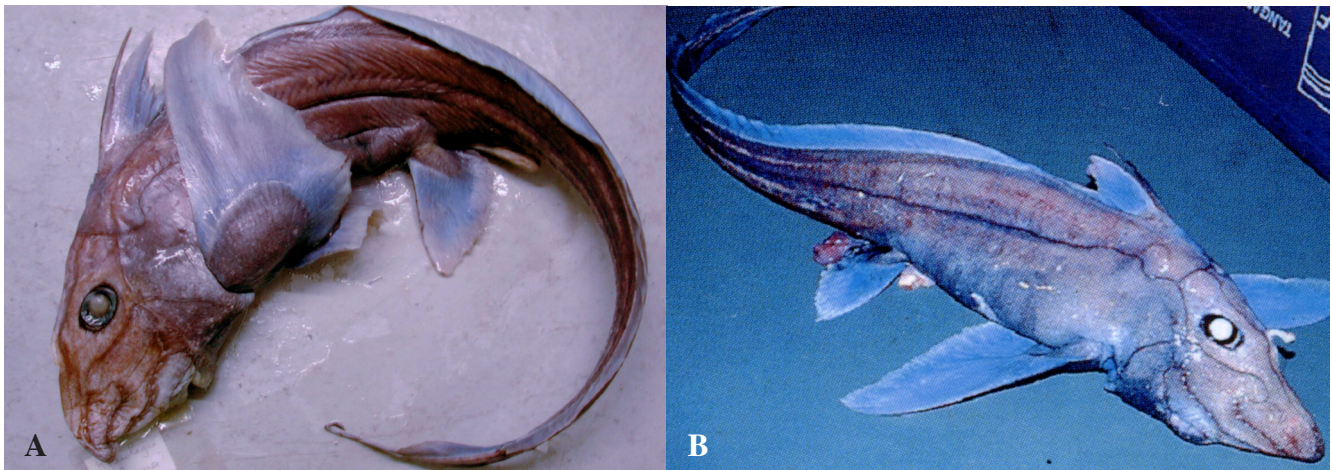


Figure 3. - Photographs of the holotype of *Hydrologus trolli* sp. n., MNHN 1998-679, adult male 1030 mm TL. **A:** After preservation. **B:** Freshly caught. Photos B. Séret / IRD.

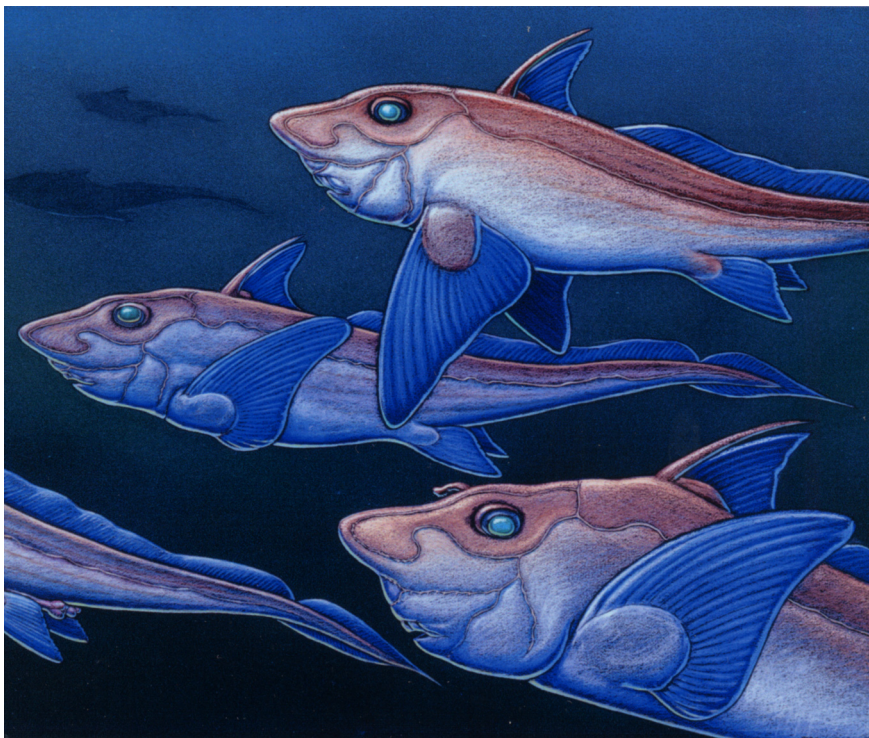


Figure 4. - Illustrations of head and tail (bottom) of the holotype of *Hydrologus trolli* sp. n. MNHN 1998-679 and composite illustrations (top and middle) of two paratypes, showing the variations in the shape of the lateral-line canals of the head and trunk. Illustrations by Ray Troll (© 2001).

173°49.9'E), 1296-1346 m, R/V "Willmatch" 022/89, 25 Sept. 1989; NMNZ P24479, male, 1058 mm TL, 720 mm BDL, Hikurangi Trough (39°51.9'S, 177°55.3'E), 1228-1276 m, R/V "Willmatch" 163/89; NMNZ P24858, 2 males, 716-780 mm TL, 410-455 mm BDL, Southwest Bounty Trough (39°54.1-57.0'S-174°26.1-33.3'E), 1356 m, R/V "Amatal Explorer", 23 Nov. 1989; NMNZ P25932, male, 980 mm TL, 624 mm BDL, Challenger Plateau (40°17.2'S, 168°29.9'E), 921-925 m, R/V "Willmatch" 1/90, 7 Jul. 1990; P25938, female, 1014 mm TL, 603 mm BDL, Northwest Chatham Rise (42°32.1-33.0'S, 176°30.8-34.4'E),

1483-1481 m, R/V "Cordella" C2/011/90, 16 Jun. 1990; NMNZ P25970, 2 males, 1020-1115 mm TL, 645-714 mm BDL, North Chatham Rise (42°44.5-44.7'S, 179°14.9-10.7'E), 1378-1372 m, R/V "Cordella" C2/037/90, 21 Jun. 1990; NMNZ P26953, male, 963 mm TL, 633 mm BDL, South Chatham Rise (44°42.6'S, 179°07.3'W), 1343-1351 m, R/V "Cordella" C04/084/90, 10 Nov. 1990; NMNZ P28647, 2 males, 922-1030 mm TL, 563-670 mm BDL, Chatham Rise (42°31.2-31.3'S, 178°30.5-34.6'W), 1452-1464 m, R/V "Tangaroa" Tan 9206/060, 16 Jun. 1992; NMNZ P31189, 3 females, 930-1030 mm TL, 570-690 mm BDL, Eastern

Chatham Rise (42°41.63-41.76'S, 172°38.03-40.04'W), 1694-1707 m, R/V "Tangaroa" Tan 9406/082, 21 May 1994; MNHN 1998-671, juvenile male, 652 mm TL, 338 mm BDL, South Pacific, New Caledonia (25°34.29' S, 167°25.08'E), 1160-1132 m, R/V "Tangaroa", HALIPRO 2, sta. BT42, 15 Nov. 1996, bottom trawl; MNHN 1998-680, adult female, 1204 mm TL, 788 mm BDL, South Pacific, New Caledonia (18°43.978'S, 163°27.397'E), 612-700 m, R/V "Alis", HALICAL 2, sta. 6, 20 Jan. 1995, longline.

Diagnosis

A species of chimaeroid fish assigned to the genus *Hydrolagus* on the basis of a ventral caudal fin that is not deeply indented at its origin to form a separate anal fin. *Hydrolagus trolli* is distinguished from its congeners by the following combination of characters: even blue-gray coloration with dark line around orbit and dark shadowing along edges of lateral-line canals; distinctly pointed snout; preopercular and oral lateral-line canals typically sharing a common branch; first dorsal fin concave with pale margin; males with frontal tenaculum deeply curved, upturned distally with spines along dorsal upturned edge; prepelvic tenacula deeply indented along distal margin; and pelvic claspers with pale fleshy distal lobes, divided distally for 1/3 their length, tips usually extending beyond distal edge of pelvic fins.

Description

Measurements of holotype and paratypes are shown in table I. Large-bodied species (adult TL > 930 mm, BDL > 570 mm) with relatively elongate and slender body, evenly tapering from a narrow head with pointed snout to an elongate, whip-like tail, unlike most large-bodied chimaeroids which tend to have massive chunky heads with blunt snouts and large bodies that taper relatively rapidly to the elongate whip-like tail. Skin firm and intact, not deciduous. Eye large (22.9-43.9 mm; 17-24% HDL) with a distinct black margin around the orbit. Tail tapers to a short, blunt caudal filament. Pectoral fins large and triangular shaped, usually tapering to a slender point distally, more rounded and broad in immature specimens, reaching to the pelvic fin base when depressed (Fig. 5A). Pelvic fins broad and squared along the distal edge, slightly rounded along the medial edge in some specimens (Fig. 5B). First dorsal fin triangular, concave along distal edge, preceded by a stout spine. Spine keeled anteriorly, becoming smooth in larger specimens, with two rows of small serrations along the distal 1/3 of the posterior surface. Spine nearly equal to height of first dorsal fin, usually shorter than the first dorsal fin in juveniles and just slightly longer than first dorsal fin height in adults. Fin spine just reaches origin of second dorsal fin when depressed. Second dorsal fin elongate, gently sloping

anteriorly to uniform height along its length, connected to dorsal caudal fin by a narrow web of skin. Caudal fin with rounded dorsal and ventral lobes that are nearly equal in height (CDH 7.6-26.7 mm, 2-5% BDL; CVH 7.9-23.6 mm, 2-4% BDL), ventral caudal lobe longer than dorsal caudal lobe, originating anterior to dorsal caudal lobe as a fleshy ridge along the ventral side of the tail and inserting posterior to insertion of dorsal caudal lobe.

Color

Freshly-caught specimens uniform, pale blue-gray, slightly darker and more slate colored ventrally; paler on the snout and head, turning darker brown in fixative, darker on ventral part of snout, head and trunk; area around mouth pale; often with faint dark longitudinal stripes visible on the base of the tail. Paired and unpaired fins even blue, turning brown or purplish in fixative. Distal edge of fins of fresh and fixed specimens pale.

Dentition

Tooth plates yellowish. Upper anterior tooth plates (vomerine) small, incisor-like with 6 or 7 rows of tritor knobs visible along the cutting edge. Posterior upper tooth plates (palatine) with tritors on worn surface (details not readily visible in specimens with mouths fixed shut). Lower tooth plates (mandibular) incisor like with two large tritors at the symphysis forming a pointed blade that becomes deeply indented along the edge; occluding with the vomerine tooth plates then rises again at the postero-lateral (labial) edge of the tooth plate; 2 large tritors at the leading edge as the tooth plate gradually slopes posteriorly along worn edge.

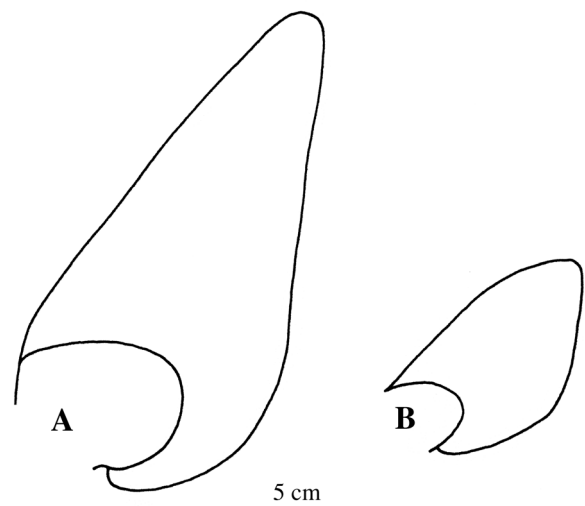


Figure 5. - Composite sketch showing general shape of the pectoral fin (A) and of the pelvic fin (B) of *Hydrolagus trolli* sp. n.

Table I. - Measurements in mm and in percentage of the body length (% BDL) for the type series of *Hydrolagus trolli* sp. n.

| | Holotype MNHN 1998-679 | | Paratypes Females (n = 5) | | Paratypes Males (n = 17) | |
|------|------------------------------|------|---------------------------------|------------|--------------------------------|------------|
| | mm | %BDL | range mm | range %BDL | range mm | range %BDL |
| TL | 1030 | 159 | 930-1204 | 149-168 | 652-1115 | 147-193 |
| PCL | 855 | 132 | 760-993 | 126-133 | 425-910 | 124-130 |
| BDL | 650 | 100 | 570-788 | 100 | 338-720 | 100 |
| SVL | 394 | 61 | 415-511 | 64-75 | 221-494 | 59-73 |
| TRL | 210 | 32 | 232-330 | 35-43 | 142-295 | 35-44 |
| PD2 | 330 | 51 | 325-420 | 53-58 | 167-385 | 49-59 |
| PD1 | 210 | 32 | 190-247 | 28-35 | 106-230 | 28-35 |
| POB | 115 | 18 | 97-126 | 14-18 | 54-118 | 14-17 |
| D2B | 562 | 87 | 423-570 | 72-82 | 263-545 | 73-78 |
| D2AH | 21.7 | 3 | 20.9-30.4 | 3-5 | 14.4-26.2 | 3-6 |
| D2PH | - | - | - | - | 22.5-27.4 | 3-4 |
| D1B | 113.8 | 18 | 92.7-107 | 14-17 | 52.3-111 | 12-20 |
| DSA | 113.8 | 18 | 114.1 | 17 | 72.9-120 | 17-22 |
| D1H | 96.6 | 15 | 86.9-115.9 | 13-16 | 56.5-113.2 | 12-18 |
| CDM | 136 | 21 | 115-151 | 17-26 | 89-167 | 18-27 |
| CDH | 15.7 | 2 | 19.4-27.6 | 3-4 | 7.6-26.7 | 2-5 |
| CTL | 175 | 27 | 160-220 | 23-37 | 160-248 | 29-66 |
| CVM | 214 | 33 | 176-246 | 26-41 | 153-258 | 26-51 |
| CVH | 16.6 | 3 | 18.3-25.9 | 3-4 | 7.9-23.6 | 2-4 |
| HDL | 200 | 31 | 183-220 | 27-41 | 105-205 | 24-33 |
| P1A | 210 | 32 | 216-240 | 29-38 | 123-238 | 30-39 |
| P2A | 105 | 16 | 105-154 | 16-21 | 57-127 | 15-24 |
| IDS | 32.3 | 5 | 26.9-60 | 5-9 | 11.4-90 | 3-13 |
| PPS | 153 | 24 | 188-260 | 32-33 | 107-230 | 28-35 |
| D1P1 | 135 | 21 | 120-205 | 18-26 | 64-147 | 16-27 |
| D1P2 | 250 | 39 | 270-330 | 42-48 | 136-300 | 38-45 |
| D2P1 | 190 | 29 | 183-265 | 32-34 | 92-230 | 26-36 |
| D2P2 | 150 | 23 | 160-203 | 26-28 | 88-172 | 21-27 |
| EYL | 35.4 | 5 | 31.6-43.9 | 5-6 | 22.9-42 | 5-8 |
| EYH | 24.8 | 4 | 23.5-31.4 | 4-5 | 15.4-33 | 3-6 |
| CLT | 90.3 | 14 | - | - | 9.3-98.5 | 3-15 |
| CLM | 26.4 | 4 | - | - | 23-32.4 | 3-5 |
| CLL | 26.1 | 4 | - | - | 23.4-88 | 4-16 |
| ONC | 22.2 | 3 | 21.1-23.8 | 3-4 | 10-24 | 3-4 |
| LRC | 8.6 | 1 | 6.4-12 | .9-2 | 6.1-11.8 | 1-2 |
| LNC | 44.5 | 7 | 40.5-48.3 | 6-7 | 23.4-41.5 | 5-8 |
| IOA | 23.5 | 4 | 24.9-30.4 | 4-5 | 14.5-26.5 | 4-5 |
| OTM | 51.8 | 8 | 46.9-56.4 | 7-8 | 26.3-51.5 | 7-10 |
| OCL | 28 | 4 | 19-34.5 | 3-4 | 14.6-24.9 | 3-4 |
| STL | 27.2 | 4 | 25.6-46.8 | 4-6 | 16.4-30.6 | 4-7 |
| SPS | 35.4 | 5 | 34.3-43 | 4-6 | 12.9-42.2 | 3-6 |
| FTL | 26.8 | 4 | - | - | 6.1-23.6 | 2-4 |

Lateral-line canals

Lateral-line canals of the head appear as open grooves with canals on the snout characterized by wide dilations. In *Hydrolagus trolli* the canals on the head and trunk appear outlined with dark edges. The basic pattern of lateral-line

canals for all members of the family Chimaeridae is illustrated and described in Didier (1995, 1998). The key area of variation among chimaeroids is the branching of the oral (= horizontal + oral in Didier, 1995) and preopercular (= hyomandibular in Didier, 1995) canals from the infraor-

bital canal. In *Hydrolagus trolli* the preopercular and oral canals branch together from the infraorbital canal and share a short common branch (Fig. 2A), and occasionally appear to fork together from the infraorbital canal. Variations on this pattern are rare, with the only exception being MNHN 1998-680 in which the oral and preopercular canals on one side of the head branch separately from the infraorbital canal. The trunk canal is nearly straight, sometimes with gentle undulations in the mid-trunk region.

Secondary sexual characteristics

Present only in sexually mature males these features are shown in figure 6. The frontal tenaculum, located medially on the head just anterior to the eyes, is relatively slender at its base and curves gently to terminate in a large, spinous bulb which rests in a pouch of skin atop the head. The distal bulb bears 8-10 overlapping rows of denticles along the underside of the bulb. Dorsal surface of the tenaculum upturned distally with denticles extending onto the dorsal surface along the upturned edge. Paired prepelvic tenacula articulate with anterior edge of pelvic girdle and each is concealed in a slit-like pouch on the ventral surface of the body just anterior to the pelvic fins. Prepelvic tenacula spatulate, curved along the lateral edge, with an indentation along the distal edge and a prominent medial point. A fleshy fold of skin partially covers the lateral side of the blade. 4-5 prominent denticles along medial edge. Paired pelvic claspers are large with a muscular base and fleshy, bulbous tips covered in a shagreen of fine denticles. Pelvic claspers are bifurcate, divided distally for 1/3 their length, with a third, fleshy lobe that lies along the dorsal side of the medial cartilaginous arm. The medial arm is slender, bent at its distal end, with a small fleshy tip, and the lateral arm is more robust with a large fleshy tip. The clasper groove runs the length of the pelvic clasper and into a hollow central groove within the lateral arm of the clasper. Pelvic claspers dark purplish with paler fleshy tips varying from purplish to white; reaching to, and usually beyond, distal edge of pelvic fins. An anal pad is present in females. Sexual maturity probably reached at about 650 mm BDL in males and 550 mm in females.

Etymology

Named for Ray Troll, an artist of fishes, and one of the few true chimaeroid lovers of the world. This fish is named in his honor for his valiant efforts to increase ratfish awareness worldwide.

Remarks

Hydrolagus trolli is presently known from deep water fishing grounds off New Zealand and New Caledonia in depths ranging from 612-1707 m. It looks similar, in shape and color, to the eastern north Atlantic species *Hydrolagus*

pallidus Hardy & Stehmann, 1990; so a side-by-side comparison was necessary to confirm the distinction between these two species. Both are relatively large-bodied species with a pale bluish or grayish color, they share a pointed snout and dark margin around the eye and have preopercular and oral canals that may branch together. However, *H. pallidus* is generally a larger-bodied species with larger head and eye (EYL 31.1-38.3 mm; 20-24% HDL), reaches sexual maturity at greater sizes than *H. trolli* (TL > 1000 mm; BDL > 700 mm), usually has canals that branch separately rather than together, and has a spine that is usually longer than the first dorsal fin. Additionally, *H. trolli* can be distinguished from *H. pallidus* by a more pointer snout and narrower head, more obvious dark ring around the eye and deeper blue color, turning brown or purplish in fixative whereas *H. pallidus* usually turns pale to whitish in fixative.

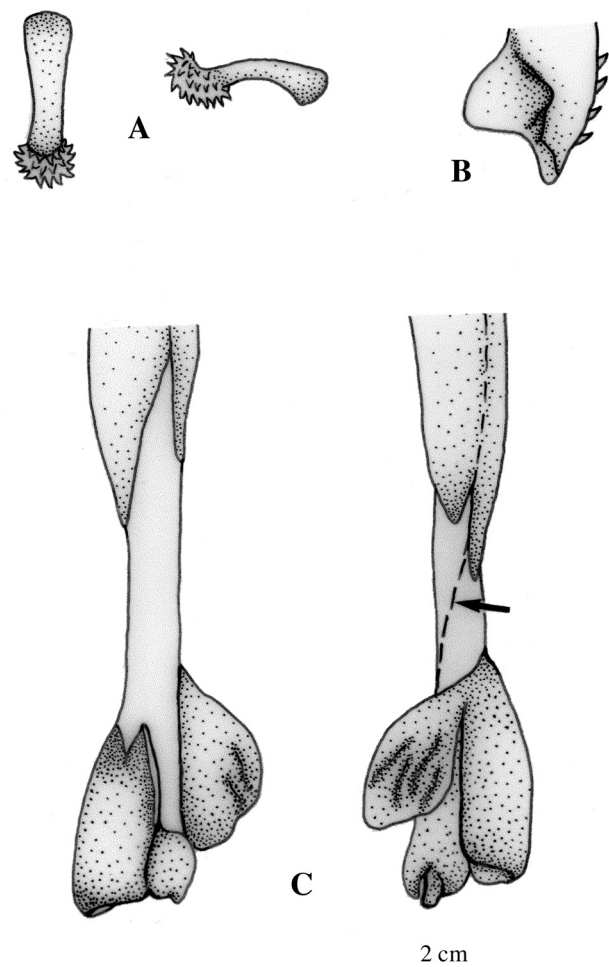


Figure 6. - Secondary sexual characteristics of adult males of *Hydrolagus trolli* sp. n. A: Frontal tenaculum in dorsal and lateral view. B: Prepelvic tenaculum in dorsal view showing denticles along medial edge and fold of skin on lateral surface. C: Pelvic clasper in ventral (left) and dorsal (right) views. Arrow indicates dashed line marking the location of the clasper groove.

Hydrolagus trolli also differs from *H. pallidus* in having pelvic claspers that reach beyond the distal margin of the pelvic fins, a frontal tenaculum that is upturned and its distal edge not flat, first dorsal fin with pale margin rather than the darker margin observed in some specimens of *H. pallidus*. *Hydrolagus trolli* has a longer tail than *H. pallidus*, observed as the distance from pelvic insertion to second dorsal fin (PPS into D2B: 2.2-3.7 times in *H. trolli* and 2.1-2.4 times in *H. pallidus*). *Hydrolagus pallidus* has also been described as having a prepelvic tenaculum with relatively straight distal margin which would set it apart from *H. trolli*; however, some specimens identified as *H. pallidus* seem to have a prepelvic tenaculum that is deeply indented, so this character may not be reliable for distinguishing the species.

DISCUSSION

Three species of chimaerids, representing two different families, were collected in New Caledonian waters: *Hydrolagus trolli* and *Chimaera phantasma* (Family Chimaeridae) and *Rhinochimaera pacifica* (Family Rhinochimaeridae). *Hydrolagus trolli* is a new species currently known only from deep waters off New Caledonia and New Zealand, but this species may be more widespread throughout the southern ocean. A single specimen (MNHN 1998-1108) collected off Saint Paul Island in the southern Indian Ocean may be *H. trolli*; thus indicating that the species has a wider geographic range than reported herein. However, the specimen is in poor condition and without a larger sample it is not possible to confirm this hypothesis.

Chimaera phantasma was originally described from Japan and has been collected throughout northwestern Pacific from the Yellow Sea and East China Sea to the Philippines. *Rhinochimaera pacifica* is commonly collected in deep water trawls off New Zealand and Japan. Its capture in water around New Caledonia further support the hypothesis that this species is widespread in deep water throughout the Pacific Ocean.

Last and Séret (1999) showed that the chondrichthyan fauna in the tropical Australasian region accounts for a third of the world's fauna (about 300 species) with a high level of endemism. However, the Indian Ocean sector exhibits a higher diversity than the Pacific one. For the chimaeroids, their diversity is about the same in the three sub-regions: northwestern Australia, northeastern Australia and New Caledonia, but very low in the Indonesian region, possibly because lack of deep sea sampling.

Comparative material

Chimaera phantasma. - 4 specimens. MNHN 1998-673, adult male, 896 mm TL, 542 mm BDL, Norfolk Island (23°37'S,

167°39'W), 486-962 m, R/V "Tangaroa", HALIPRO 2, sta. BT93, 24 Nov. 1996, bottom trawl; MNHN 1998-676-677, 2 adult females, 890-1087 mm TL, 527-615 mm BDL, New Caledonia (18°47'S, 163°28'E), 635-700 m, HALICAL 1, sta. 12, 27 Nov. 1994; MNHN 1998-678, adult female, 1008 mm TL, 621 mm BDL, New Caledonia (18°40'S, 163°26'E), 587-605 m, HALICAL 1, sta. 5, 24 Nov. 1994.

Hydrolagus pallidus. - 4 specimens. ANSP 178019, male, 1083 mm TL, 683 mm BDL, NE Atlantic (57°30'N, 9°30'W), "Galibier", July 1998; ANSP 174645, male, 1043 mm TL, 700 mm BDL, USA, NW Atlantic; BMNH 1988.6.28.1-2, paratypes, 1 female, 1 male, 833-1113 mm TL, 560-733 mm BDL, off W. Scotland (56°52'N, 9°34'W), 1725-1750 m, sta. 20/87/13, 25 Oct. 1987.

Rhinochimaera pacifica. - 3 specimens. MNHN 1998-672, female, 1007 mm TL, 397 mm BDL South Pacific, New Caledonia (25°43.29'S, 167°12.23'E), 1033-1200 m, R/V "Tangaroa", HALIPRO 2, sta. BT44, 15 Nov. 1996, bottom trawl; MNHN 1998-674, female, 1197 mm TL, 556 mm BDL South Pacific, New Caledonia (24°44.90'S, 167°43.10'E), 1246-1213 m, R/V "Tangaroa", HALIPRO 2, sta. BT74, 20 Nov. 1996, bottom trawl; MNHN 1998-675, female, 860 mm TL, 322 mm BDL, South Pacific, New Caledonia (25°34.29'S, 167°25.08'E), 1160-1132 m, R/V "Tangaroa", HALIPRO 2, sta. BT42, 15 Nov. 1996, bottom trawl.

Acknowledgments. - Supported by a fellowship to the MNHN and NSF DEB-9510735 to D. Didier. Also funded in part by the New Zealand Foundation for Scientific Research and Technology, Biosystematics of NZ EEZ Fishes Project, contract MNZ603, C. Roberts, program leader. Special thanks to Patrice Pruvost and Xavier Gregorio for assistance in Paris, and thanks to C. Roberts and A. Stewart for assistance at the NMNZ and for arranging loan and gift of specimens. The ZoNeCo program support BS participation to the trawling cruise HALIPRO 2.

REFERENCES

- COMPAGNO L.J.V., STEHMANN M. & D.A. EBERT, 1990. - *Rhinochimaera africana* a new longnose chimaera from southern Africa, with comments on the systematics and distribution of the genus *Rhinochimaera* Garman, 1901 (Chondrichthyes, Chimaeriformes, Rhinochimaeridae). *South Afr. J. Mar. Sci.*, 9: 201-222.
- DIDIER D.A., 1998. - The leopard Chimaera, a new species of chimaeroid fish from New Zealand (Holocephali, Chimaeriformes, Chimaeridae). *Ichthyol. Res.*, 45(3): 281-289.
- DIDIER D.A. & K. NAKAYA, 1999. - Redescription of *Rhinochimaera pacifica* (Mitsukuri) and first record of *R. africana* Compagno, Stehmann & Ebert from Japan (Chimaeriformes: Rhinochimaeridae). *Ichthyol. Res.*, 46: 139-152.
- DIDIER D.A. & M. STEHMANN, 1996. - *Neoharriotta pumila*, a new species of longnose chimaera from the northwestern Indian Ocean (Pisces, Holocephali, Rhinochimaeridae). *Copeia*, 1996(4): 955-965.

- GRANDPERRIN R., FARMAN R., LORANCE P., JOMESSY T., HAMEL P., LABOUTE P., LABROSSE P., RICHER de FORGES B., SÉRET B. & S. VIRLY, 1997. - Campagne HALIPRO 2 de chalutages exploratoires profonds dans le sud de la zone économique de Nouvelle-Calédonie (R.V. Tangaroa, 4-28 novembre 1996). ZoNeCo, Rapport de mission, 150 p.
- GRANDPERRIN R., AUZENDE J.M., HENIN C., LAFOY Y., RICHER de FORGES B., SÉRET B., VAN de BEUQUE S. & S. VIRLY, 1999. - Swath-mapping and related deep-sea trawling in the southeastern part of the economic zone of New Caledonia. In: Proc. 5th Indo-Pac. Fish Conf., Nouméa, 1997 (Séret B. & J.Y. Sire, eds), pp. 459-468. Paris: Soc. Fr. Ichtyol. & IRD.
- HARDY G.S. & M. STEHMANN, 1990. - A new deep-water ghost shark, *Hydrolagus pallidus* n. sp. (Holocephali, Chimaeridae), from the Eastern North Atlantic, and redescription of *Hydrolagus affinis* (Brito Capello, 1867). *Archiv FischWiss.*, 40: 229-248.
- LAST P.R. & B. SÉRET, 1999. - Comparative biogeography of the chondrichthyan faunas of the tropical south-east Indian and south-west Pacific oceans. In: Proc. 5th Indo-Pac. Fish Conf., Nouméa, 1997 (Séret B. & J.Y. Sire, eds), pp. 293-306. Paris: Soc. Fr. Ichthyol. & IRD.
- LAST P.R. & J.D. STEVENS, 1994. - Sharks and Rays of Australia. CSIRO Australia, 513 p.
- LEVITON A.E., GIBBS R.H. Jr., HEAL E. & C.E. DAWSON, 1985. - Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia*, 1985: 802-832.
- PAULIN C., STEWART A., ROBERTS C. & P. McMILLAN, 1989. - New Zealand Fish. A Complete Guide. Wellington: National Museum of New Zealand Miscellaneous Series No. 19, 279 p.
- RICHER DE FORGES B., 1993. - Campagnes d'exploration de la faune bathyale faites depuis 1989 dans la zone économique de la Nouvelle-Calédonie. In: Résultats des campagnes MUSORSTOM, vol. 10 (Crosnier A., éd.), *Mém. Mus. natn. Hist. Nat.*, 156: 9-25.
- SÉRET B., 1994. - Chondrichthyan fishes of New Caledonia. *Chondros*, 5(3): 6-9.
- SÉRET B., 1997. - Poissons de profondeur de Nouvelle-Calédonie: apports des campagnes MUSORSTOM. Deep water fishes of New Caledonia: contributions of the MUSORSTOM cruises. In: Résultats des Campagnes MUSORSTOM (Séret B., éd.), vol. 17, *Mém. Mus. natn. Hist. Nat.*, 174: 9-16.
- SÉRET B., GRANDPERRIN R. & J. RIVATON, 1997. - Poissons de profondeur et ressources halieutiques de la zone économique de la Nouvelle-Calédonie. *Cybiuim*, 21(1) suppl.: 99-106.

Reçu le 03 décembre 2001.

Accepté pour publication le 10 mai 2002.